

REMARKS

Claims 1-10 are pending in the above-identified application and stand ready for further action on the merits.

Claims 2, 4, 6, and 7 have been amended to correct typographical errors. The present amendments to the claims do not introduce new matter into the application as originally filed.

Rejections under 35 U.S.C. § 102

1) Claims 1-10 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Morinaga '744 (US 6,896,744). Applicants respectfully assert that Morinaga '744 does not disclose each and every element of independent claim 1. Therefore, Morinaga '744 does not anticipate or render obvious claim 1.

The Examiner asserts that the cleaning solution of Morinaga '744 includes hydrofluoric acid. However, the Examiner cites a portion of Morinaga '744 that refers to the prior art. Moreover, the citation refers to the use of 10 wt ppm of hydrofluoric acid, which is outside the range of the present invention.

Regardless, although described by Morinaga '744, RCA cleaning is known as conventional technology. This RCA cleaning consists of SC-1 cleaning and SC-2 cleaning. SC-1 cleaning consists of a solution of ammonia, hydrogen peroxide, and deionized water. SC-1 cleaning is for removing particles. SC-2 cleaning consists of a solution of chloride, hydrogen peroxide, and deionized water. SC-2 cleaning is for removing metal impurities. However, there is no description about mixing and using these cleaning liquids, which can remove particle and metal impurities with one cleaning liquid, in this reference. Morinaga '744 teaches the use of

hydrofluoric acid independently. Furthermore, Morinaga '744 describes that the corrosion of the surfaces, such as a substrate, becomes a problem.

The substrate surface cleaning method of Morinaga '744 involves cleaning the substrate surface with an alkaline cleaning agent in step (1) and then cleaning with a cleaning agent having a hydrofluoric acid content of from 0.03 to 3 wt % in step (2). Thereby, Morinaga '744 suggests that heavy metal impurities and particles are removable. In other words, Morinaga '744 describes the hydrofluoric acid being in a separate solution, which is applied in a separate step of the process and for specific amounts of time (see claim 1). The hydrofluoric acid is not contained in the same solution as phosphoric acid.

Only acid solution and alkaline solution are used in Morinaga '744. It is the combination of two or more washing processes that pH differs. Furthermore, Morinaga '744 does not disclose a single cleaning liquid.

In stark contrast, the present invention is greatly different from Morinaga '744 in that it has the function and effect of removing both metal impurities and particles by one liquid composition. In other words, the present invention has an alkali component and hydrofluoric acid in one liquid, which can remove both heavy metal impurities and particles. Furthermore, claim 1 requires that one aqueous solution contains both phosphoric acid and hydrofluoric acid.

In view of the above, it is believed that the claimed invention is neither anticipated by nor rendered obvious over Morinaga '744.

2) Claims 1-10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Nohara '322 (US 6,686,322). Applicants respectfully assert that Nohara '322 does not disclose

each and every element of independent claim 1. Therefore, Nohara '322 does not anticipate or render obvious claim 1.

Nohara '322 discloses a cleaning agent which consists of an oxidizing agent and a chelating agent. Phosphoric acid is illustrated as a chelating agent. However, oxidizing agents are only organic peroxides such as benzoyl peroxide and inorganic peroxides such as hydrogen peroxide, ozone, and perchloric acid. Hydrofluoric acid is not an oxidizing agent.

As discussed above, the Examiner cites to other prior art from the background of Nohara '322 to show hydrofluoric acid. However, the cleaning liquid of Nohara '322 does not include hydrofluoric acid. In fact, Nohara '322 actually discusses the *disadvantages* of prior art cleaning agents with hydrofluoric acid.

In stark contrast, the present invention does include hydrofluoric acid as well as phosphoric acid and ammonia and/or amine.

In view of the above, it is believed that the claimed invention is neither anticipated by nor rendered obvious over Nohara '322.

3) Claims 1-10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Sakon '857 (US 5,560,857). Applicants respectfully assert that Sakon '857 does not disclose each and every element of independent claim 1. Therefore, Sakon '857 does not anticipate or render obvious claim 1.

Fundamentally, the cleaning solution of Sakon '857 is an aqueous solution containing 0.005% to less than 0.05% by weight hydrogen fluoride and 0.3% to 20% by weight hydrogen peroxide, having a pH in the range of 1 to less than 5.

Although Example No. 62 of Table 1 contains phosphoric acid (3.92% of the weight) and ammonia (1.02% of the weight), it is a comparative example. With respect to Comparative Example No. 62, both the life time and the number of adhered fine particles after cleaning are inferior to the present invention (see Examples in present application).

The actual cleaning solution taught by Sakon '857 discloses 0.005 mol/L of ammonia in Example No. 9 and 0.01 mol/L of phosphoric acid in Example No. 13.

When converted into a weight percentage, the ammonia is about 0.0085% of the weight (in Example No. 9) and the phosphoric acid becomes 0.1% of the weight (in Example No. 13). Thus, both are outside of the claim range of the present invention.

According to MPEP 2145, rebuttal evidence and arguments can be presented in the specification, *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995). Office personnel should consider all rebuttal arguments and evidence presented by applicants. See, e.g., *Soni*, 54 F.3d at 750, 34 USPQ2d at 1687 (error not to consider evidence presented in the specification). Rebuttal evidence may also include evidence that the claimed invention yields unexpectedly improved properties or properties not present in the prior art. Rebuttal evidence may consist of a showing that the claimed compound possesses unexpected properties. *Dillon*, 919 F.2d at 692-93, 16 USPQ2d at 1901.

In view of the above, it is believed that the claimed invention is neither anticipated by nor rendered obvious over Sakon '857.

4) Claims 1-10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Verhaverbeke '123 (US 5,972,123). Applicants respectfully assert that Verhaverbeke '123 does

not disclose each and every element of independent claim 1. Therefore, Verhaverbeke '123 does not anticipate or render obvious claim 1.

Verhaverbeke '123 discloses a method of performing etching and cleaning of a semiconductor wafer using a solution which contains ammonium fluoride. The ammonium fluoride is produced from a solution of ammonium hydroxide and hydrogen fluoride (col. 6, lines 34-49).

The Examiner cites portions of Verhaverbeke '123 that relate to phosphoric acid, hydrofluoric acid, ammonia, and hydrogen peroxide (col. 5, lines 11-30). However, this citation refers only to possible reactive chemical process liquids of Verhaverbeke '123. In other words, the citation enumerates several solutions combined with a buffer agent. However, Verhaverbeke '123 does not disclose the combination of each of these components into one liquid.

In stark contrast, the present invention includes phosphoric acid, ammonia and/or amine, and hydrofluoric acid as a single solution.

Verhaverbeke '123 only describes the etching process with a buffered hydrofluoric acid solution. Phosphoric acid, hydrogen peroxide, and ammonium are shown as variations of a buffer agent solution. However, Verhaverbeke '123 does not teach or suggest using all of the components of instant claim 1 in a single solution. The examples of Verhaverbeke '123 relate only to the examination of etching thermal oxide and silicone nitride wafers. When the liquid of Verhaverbeke '123 is used for cleaning, the wafer and the element would receive damage.

In view of the above, it is believed that the claimed invention is neither anticipated by nor rendered obvious over Verhaverbeke '123.

CONCLUSION

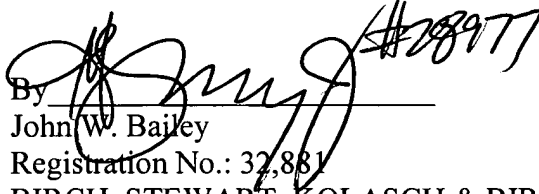
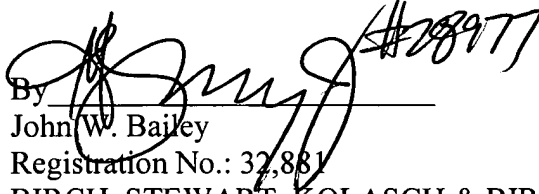
Based upon the amendments and remarks presented herein, the Examiner is respectfully requested to issue a Notice of Allowance clearly indicating that each of pending claims 1-10 are allowed and patentable under the provisions of Title 35 of the United States Code.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey (Reg. No. 32,881) at the telephone number below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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